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THE NATIONAL INSTITUTE OF POLAR RESEARCH

October 1978

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INTRODUCTION

On 29 September 1973 a government research organization, Kokuritsu Kyokuchi Kenkyujo (National Institute of Polar Research), was established under the direct jurisdiction of the Ministry of Education, Science and Culture for the furtherance of polar research in Japan. The institute, which has legal status almost equivalent to that of the national universities, is available for use by researchers from national and foreign universities and private research organizations.

At present, one four-storied building with one basement floor (total floor area 5,796 m^2) occupies 5,947 m^2 area, and a second building (total floor area about 4,000 m^2, six-storied) will be built in 1978 and 1979. Syowa and Mizuho stations in the Antarctic are affiliated establishments.

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MAJOR FUNCTIONS

1. Research activities of the permanent staff of the institute cover many scientific disciplines, including upper atmosphere physics, meteorology, glaciology, solid earth sciences, biological sciences, and polar regions engineering. The present effort is directed toward the Antarctic in close co-operation with the Japanese Antarctic Research Expedition (JARE). Co-operative studies with researchers outside the institute are also carried out.

2. The institute has as its objectives the implementation of scientific and logistics programmes of the JARE, which is under the authority of JARE Headquarters chaired by the Minister of Education, Science and Culture. The institute is responsible for maintaining two Antarctic stations: Syowa Kiti (Station) on East Ongul Island at 69°00′S and 39°35′E and Mizuho Kiti (Station), inland at 70°42′S and 44°20′E, 2,230 m above sea level. The institute has also participated in international scientific programmes such as the Dry Valley Drilling Project, the United States-Japan Meteorite Search Project, and the International Magnetospheric Study.

3. The institute provides facilities and direction for doctoral thesis research by students from the postgraduate schools of universities.

4. The institute has the responsibility for collecting, processing, and utilizing various records and samples collected by JARE and other expeditions. Upon application, researchers outside the institute can use these research materials and data processing facilities, which include HITAC M-160 and HITAC 10-II electronic computers, a scanning electron microscope, and other scientific instruments.

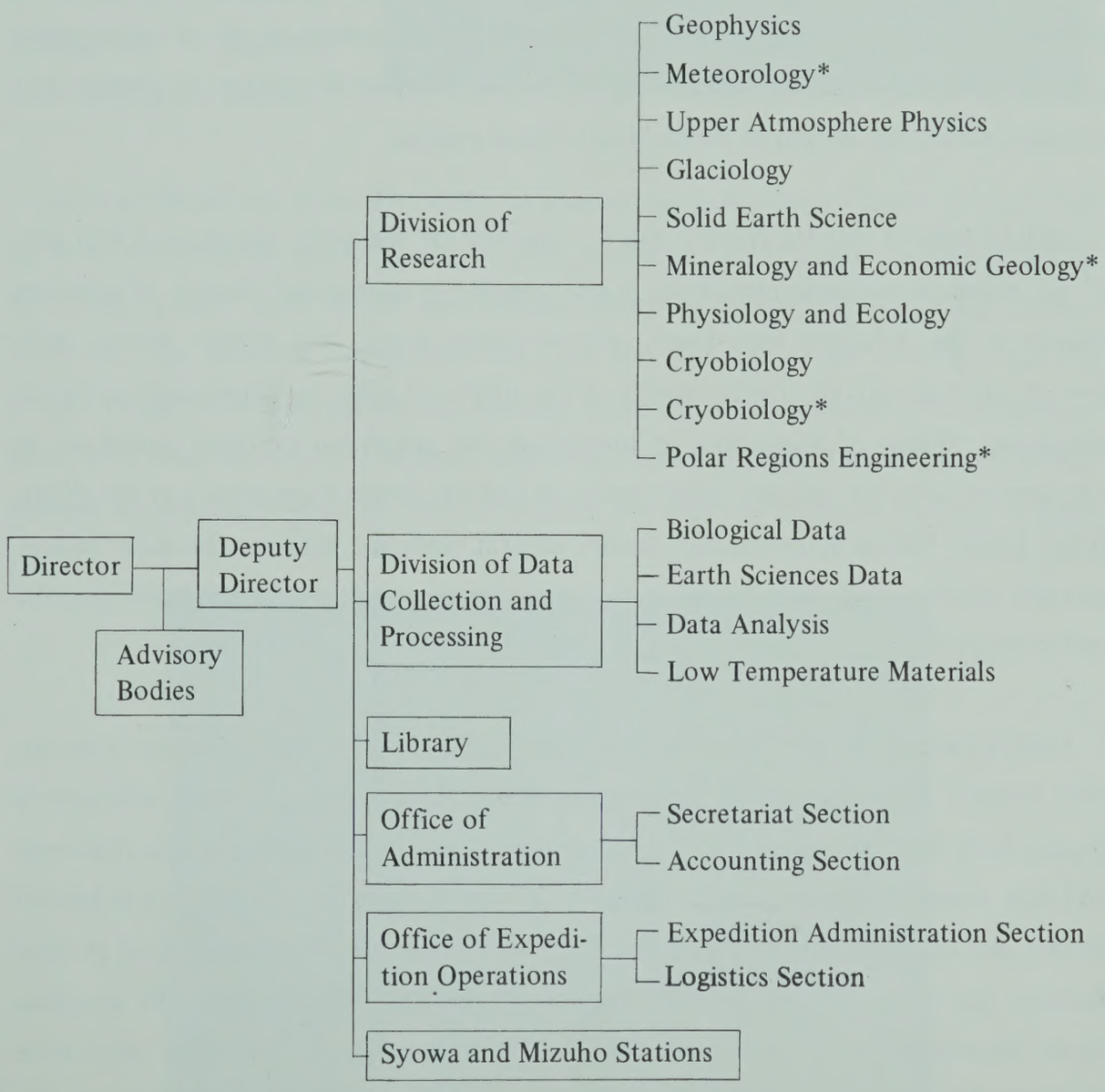
5. Research fellowships for visiting investigators from abroad are provided by the institute.

6. Permanent members of the institute represent many national and international polar research organizations. The institute maintains national SCAR (Scientific Committee on Antarctic Research, International Council of Scientific Unions) data centres for aurora, biology, geology, glaciology, logistics, and seismology.

ORGANIZATION

The institute, headed by the Director and Deputy Director, consists of four divisions: Kenkyu-kei (Division of Research, composed of six departments for permanent staff and four departments for non-permanent staff); Shiryo-kei (Division of Data Collection and Processing, composed of four departments); Jigyo-bu (Office of Expeditions, composed of two sections); Kanri-bu (Office of Administration, composed of two sections); and the Library. There are several bodies advisory to the director.

(Organization Chart)



* Department for visiting researchers.

RESEARCH ACTIVITIES

DIVISION OF RESEARCH

DEPARTMENT OF GEOPHYSICS: Geophysical studies of the East Antarctic precambrian shield are the main object of this department. To elucidate the relief of the under-ice basement and the crustral structure down to the upper mantle, studies on the methodology and geophysical prospecting have been carried out using various phenomena such as geomagnetism, gravity, elastic waves, and electromagnetic waves. Special effort is being made to develop an effective system for exploring the ice sheet by means of aircraft and the marine areas by means of aircraft and ship. Using geophysical data obtained by the JARE and other expeditions, the subterranean structure of Antarctica and adjacent continental shelves are being studied; emphasis is on the seismicity of Antarctica, ice- or snow-quakes around Syowa and Mizuho stations, upper mantle structure in relation to gravity, and volcanic and seismic activity in the McMurdo Sound regions.

DEPARTMENT OF METEOROLOGY: The role of the polar regions as a heat sink in the global atmospheric circulation is not completely understood. Studies of radiation balance in the Antarctic have been made at Syowa Station and Mizuho Station; with the aid of small aircraft, measurements of the albedo of snow, ice sheet, and sea ice are continuing. Studies of interactions of atmosphere, ice, and ocean are being carried out in conjunction with the research programmes of POLEX (Polar Experiment) in the FGGE (First GARP Global Experiment). Studies of heat exchange between the polar regions and the middle-to-low latitudes are being carried out by analysing satellite and synoptic meteorological data.

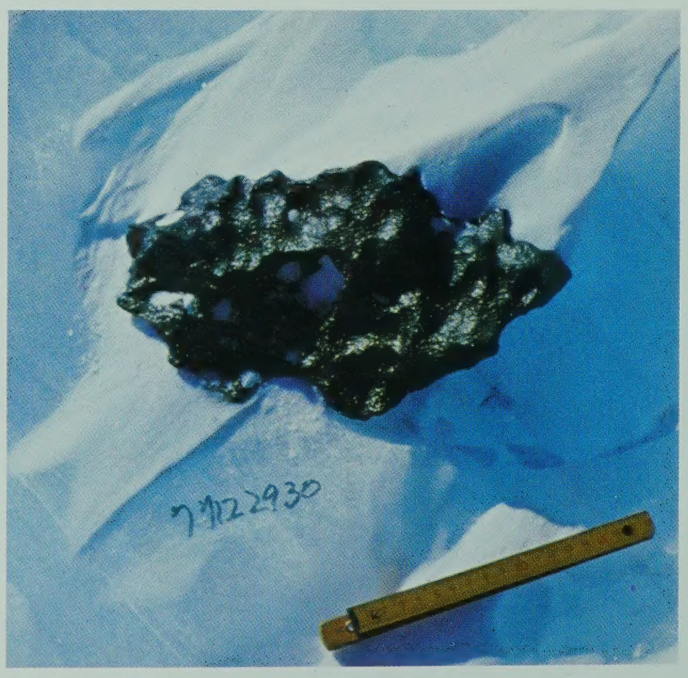
DEPARTMENT OF UPPER ATMOSPHERE PHYSICS: Since Syowa Station is favourably located under the auroral zone, many research programmes in upper atmosphere physics have been conducted with the aid of ground facilities, sounding rockets, balloons, and data acquisition facilities from satellites. Ground facilities are also installed at Mizuho Station and an unmanned station between Syowa and Mizuho. The data obtained at these facilities are being accumulated on computer compatible magnetic tapes. To elucidate upper atmosphere disturbances associated with auroras, sounding rockets are effective in observing directly the auroral luminous layer, in measuring particles, electric and magnetic

fields, and waves. Natural electromagnetic waves generated by the incidence of auroral particles have been observed simultaneously by means of rockets, satellites and ground facilities. These observations will help to clarify the mechanism of generation of such waves and their propagation characteristics in the magnetosphere and the ionosphere. Study of conjugacy of auroral phenomena in the northern and southern hemisphere is carried out at Syowa Station and its geomagnetic conjugate point, Reykjavik, Iceland.

DEPARTMENT OF GLACIOLOGY: To unravel the mechanism by which the Antarctic ice sheet is maintained and to elucidate its changes in the past, during the present, and in the future, a joint study of the mass balance of the ice surface, the ice surface configuration and the basement topography, the flow and structure of the ice sheet, and the changes of sea ice is being carried out. Detailed studies on the mechanism of snow accumulation have been conducted at Mizuho Station and repeated measurements of snow stakes between Mizuho and Syowa are being continued. Physical and chemical analyses of snow

and ice samples are carried out in the laboratory of the institute in co-operation with other institutions. Statistical analyses of surface topography, snow accumulation, and bottom topography have been carried out; another study indicated the possibility of bottom melting of the ice sheet on Mizuho Plateau. Changes in the distribution of sea ice at the offing of Syowa Station were studied in analysing meteorological satellite data supplemented with ships ice observations. Research on and development of glaciological instruments, such as an airborne radio-echo sounder, are in progress.

DEPARTMENT OF SOLID EARTH SCIENCES: DEPARTMENT OF POLAR REGIONS MINERALOGY AND ECONOMIC GEOLOGY: These departments conduct research in physical geography, geology, and applied geology. The geographical research includes investigations of topography and sediments in the vicinity of Syowa Station and submarine topography and geology along the coast. This will throw light upon the changes of the ice sheet and its environment in the Late Cenozoic era. A comparative study of physio-geography with the Dry Valley region of Victoria Land is under way. The geological research has resulted in the compilation of a series of geological maps of the Syowa Station area. Origin and mineralogy of metamorphic rocks and paleomagnetism of various rocks are also studied. The geological research is aimed toward the accumulation of fundamental data on the mineral resources of the Antarctic. In addition to the above research, investigations of the petrological, mineralogical, and magnetic properties of meteorites, which have recently been found in great numbers in the Yamato Mountains and in a part of Victoria Land (United States-Japan Meteorite Search Project), are in progress. While the search for more meteorites continues, the relationship between the character of the ice sheet and the occurrence of meteorites is being investigated.



DEPARTMENT OF PHYSIOLOGY AND ECOLOGY: The department deals with ecology and general physiology of animals and plants living in the polar regions. The relationship between the distribution of terrestrial organisms and environmental conditions is one of the important problems in the ice-free areas in the Antarctic. Particular attention is paid to the analysis of the distribution of free-living mites in relation to the physical and biological environment in the Syowa Station area in co-operation with investigators of the Department of Biological Data. Qualitative and quantitative studies of phytoplankton in the seawater and of microalgae in the sea ice are conducted. The aim is to clarify the food relations among phytoplankton, zooplankton, and fish in the coastal area of Lützow-Holm Bay where Syowa Station is located. Routine observations of the geographycal distribution of phyto- and zooplankton in the Southern Ocean are made on board the icebreaker Fuji during her relief cruises to Syowa Station.

DEPARTMENT OF CRYOBIOLOGY: Analyses of the structure and function of the off-shore ecosystem are the objectives of this department, which was established in April 1978. Biological studies on the Antarctic krill, *Euphausia superba*, have commenced. The department also makes biological studies of marine mammals, which play an important role in the marine ecosystem. In collaboration with visiting investigators, biological studies of living organisms, including man and bacteria, in the cold climate are being carried out.

DEPARTMENT OF POLAR REGIONS ENGINEERING: Since the chairs of this department are allocated for visiting professors, co-operative researches with outside investigators have been carried out to satisfy practical requirements of the JARE. Research items include cold regions buildings, oversnow and air-cushioned vehicles, various types of sledges, and many varieties of machinery. As an example, two types of wind-generators, were constructed and tested at Syowa Station.

Division of Data Collection and Processing

The staff of this division is responsible not only for curatorial work, but also conducting research on subjects relevant to the Division of Research. Most of researchers are also key members of the JARE, participating in the expedition once every few years. There are four departments in this division:

DEPARTMENT OF BIOLOGICAL DATA: Biological collections include dried specimens of moss, lichen, algae and phanerogams, preserved specimens of fungi, mites, fishes and benthos, and stuffed specimens of birds and marine mammals. Most of the materials collected by the JARE have been stored at various universities and research institutions all over the country, but now these materials are being consolidated in this department. Bryophyte specimens are increasing and they are catalogued as a computerized databank. The department is provided with a critical point disciccator, a low temperature desciccator, a scanning electron microscope with X-ray microanalyser, a universal microscope, and other instruments.

DEPARTMENT OF EARTH SCIENCES DATA: The department maintains collections of rock specimens, data on auroras, rocket soundings and geomagnetism, and earthquake records. Computerised cataloguing of samples and records is in progress. The articles left by the Shirase Expedition in 1910～1912 and the valuable photographs and records taken since the time of the first JARE in 1956/57 are also in the custody of this department, as are Antarctic meteorites to the amount of 1,300 specimens.

DEPARTMENT OF DATA ANALYSIS: This department has charge not only of the supervision and operation of computers and other data processing facilities for joint use from outside researchers, but also of methodological studies of data analysis. Data from various scientific fields obtained in the Antarctic are accumulated in the medium-size computer HITAC M-160. Efforts are being made to maintain the quality of data so that the data can be fully utilized by researchers. The computer is capable of retrieval of Antarctic bibliography, including the reports of JARE, the U. S. Antarctic Bibliography, and the Current Antarctic Literature.

DEPARTMENT OF LOW TEMPERATURE MATERIALS: This department is in charge of maintenance and supervision of low temperature research facilities for preservation and analysis of materials collected in the polar regions. Basic experiments and analyses are also conducted by the department. The main facility is the low temperature rooms: one ultralow temperature room at $-60\,^{\circ}C$ ($6\,m^2$), two low temperature rooms at $-20\,^{\circ}C$ ($47.4\,m^2$), and one cold storage at $-20\,^{\circ}C$ ($35.5\,m^2$). The facilities are open nationwide to universities and research institutions.

JAPANESE ANTARCTIC RESEARCH

In October 1956 the first Japanese Antarctic Research Expedition (JARE) was dispatched to the Antarctic to cooperate in the scientific programmes of the International Geophysical Year, 1957～1958. The expedition established a scientific station Syowa (69°00′S., 39°35′E.) on January 29, 1957. Operation has been continuous since then except for a three-year period. The operation was resumed in 1965. At present, Syowa Station is semi-permanently occupied by about 25 men. Most of the investigators of the National Institute of Polar Research have actively participated in the research programmes of JARE. Over these years the Antarctic research has produced many valuable results in many scientific disciplines, including direct observations of auroras by means of sounding rockets, the over-snow traverse to the South Pole through unexplored areas of the continent, the discovery of the Yamato meteorites (about 1,000 specimens) and the meteorites in the Victoria Land (in collaboration with a United States party).

In July 1970, Mizuho Station was established inland at 70°42′S., and 44°20′E., (elevation above sea level 2,230 m), about 270 km southeast of Syowa Station. After initial intermittent occupation, the station has been continuously occupied since May 1976 by a party of four or five men for research on upper atmosphere physics, meteorology, glaciology, and human biology.

Currently, the 19th JARE (1977 ~ 1979) occupies both Syowa and Mizuho, conducting research on upper atmosphere physics and participating in the International Magnetospheric Study (IMS), which was started from 1975. The research is aimed towards the three-dimensional and simultaneous observations of aurora and other upper atmosphere phenomena by means of sounding rockets, balloons, earth satellites, and ground-based facilities. In addition to this, on going research covers various fields, including geomagnetism, ionosphere, meteorology, earthquake, ocean tides, geodesy, geography, geology, geochemistry, glaciology, biology, and medical science.

From the 20th expedition on, the main themes of the research will be the so-called POLEX (Polar Experiment)-South, the study of air-sea-ice interaction, and the analysis of the crustal structure of the area around Syowa Station.

Basides the programmes of JARE, bilateral or multi-national programmes of polar research will be encouraged and assisted and the exchange of scientists under the Antarctic Treaty will be continued as important function of the institute.

PERMANENT STAFF

	Director	Professor	Associate Professor	Research Associate	Officer and Technician	Total
Director	1					1
Deputy Director		1				1
Division of Research		6(4)	6(4)	10	2	24(8)
Division of Data Collection and Processing		1	1	3	4	9
Library					2	2
Office of Administration					20	20
Office of Expedition Operations					44	44
Total	1	8(4)	7(4)	13	72	101(8)

Remarks: 1. Figures in parentheses indicate visiting professors.

2. The Office of Expedition Operations employs 31 civilian technicians and postgraduate students who have the status of government employees while members of JARE.

EXPENDITURE FOR FISCAL 1978

(April 1978 to March 1979)

Budget for the National Institute of Polar Research	814 million yen
Budget for expeditions allocated to the National Institute of Polar Research	829 million yen

STAFF DIRECTORY

Director: Takesi NAGATA, Professor (Geophysics)
Deputy Director: Masayoshi MURAYAMA, Professor (Expedition logistics)

DIVISION OF RESEARCH *

Head: Kou KUSUNOKI

Geophysics

Sadao KAWAGUCHI	Associate Professor (Meteorology)
Masaru AYUKAWA	Research Associate (Auroral physics)
Natsuo SATO	Research Associate (Auroral physics)

Meteorology

Masayuki TANAKA	Visiting Professor (Meteorology)
Michio YAMAZAKI	Visiting Professor (Meteorology)

Upper Atmosphere Physics

Takeo HIRASAWA	Professor (Auroral physics)
Takeo YOSHINO	Visiting Professor (Radiophysics)
Hiroshi FUKUNISHI	Associate Professor (Magnetospheric physics)
Susumu KOKUBUN	Visiting Associate Professor (Magnetospheric physics)
Ryoichi FUJII	Research Associate (Magnetospheric physics)

Glaciology

Kou KUSUNOKI	Professor (Glaciology)
Shinji MAE	Associate Professor (Glaciology)
Fumihiko NISHIO	Research Associate (Glacial-meteorology)
Yoshiyuki FUJII	Research Associate (Glaciology, permafrost)
Makoto WADA	Research Associate (Meteorology)

Solid Earth Science: Mineralogy and Economic Geology

Yoshio YOSHIDA	Professor (Geomorphology)
Katsutada KAMINUMA	Associate Professor (Solid earth geophysics)
Keiichiro KANEHIRA	Visiting Associate Professor (Economic geology)
Kiichi MORIWAKI	Research Associate (Geomorphology)
Kazuyuki SHIRAISHI	Research Associate (Metamorphic petrology)
Kazuo SHIBUYA	Research Associate (Solid earth geophysics)

Physiology and Ecology

Takao HOSHIAI	Professor (Marine ecology)
Yoshikuni OHYAMA	Associate Professor (Terrestrial ecology)
Mitsuo FUKUCHI	Research Associate (Marine ecology)

Cryobiology

Yasuhiko NAITO	Associate Professor (Marine mammals)
Takahisa NEMOTO	Visiting Associate Professor (Marine ecology)
Atsushi TANIMURA	Research Associate (Marine ecology)

Polar Regions Engineering

Koichiro YOSHIDA	Visiting Associate Professor (Shipbuilding)
Kei TERAI	Research Associate (Expedition logistics)

DIVISION OF DATA COLLECTION AND PROCESSING

Head: Tatsuro MATSUDA — Professor (Terrestrial ecology)

Biological Data

Hiroshi KANDA	Research Associate (Bryophyte taxonomy)

Earth Sciences Data

Keizo YANAI	Associate Professor (Metamorphic petrology, meteorite)
Minoru FUNAKI	Research Associate (Paleomagnetism)

Data Analysis

Mrs. Miyoko IWABUCHI, nee TAKIZAWA
Research Associate
(Computer science, ionospheric physics)

LIBRARY

Head: Tatsuro MATSUDA

OFFICE OF ADMINISTRATION

Head: Yoshihiko YOSHINO

OFFICE OF EXPEDITION OPERATIONS

Head: Sukeaki TAKEDA

* This is legal constitution; scientists at this Division, together with those at the Division of Data Collection and Processing, are resolved into 5 research groups of upper atmosphere physics, meteorology and glaciology, solid earth sciences, biological sciences, and polar regions engineering.

PUBLICATIONS

(1) **南極資料,** Nankyoku Shiryō (Antarctic Record, in Japanese and English) (Irregular, 3 or 4 volumes per year)

No. 1 (1957) – No. 61 (1978) +

(2) Memoirs of National Institute of Polar Research (Formerly Japanese Antarctic Research Expeditions Scientific Reports, irregular)

Series A (Aeronomy), No. 1 (1963) – No. 14 (1976) +.

Series B (Meteorology), No. 1 (1969) – No. 2 (1974) +.

Series C (Earth Sciences), No. 1 (1964) – No. 12 (1977) +.

Series D (Oceanography), No. 1 (1964) +.

Series E (Biology), No. 1 (1959) – No. 32 (1976) +. Nos. 1 – 17 were published by the Seto Marine Biological Laboratory, Kyoto University.

Series F (Logistics), No. 1 (1964) – No. 2 (1976) +.

Special Issue, No. 1 (1967) – No. 8 (1978) +.

(3) JARE Data Reports (Irregular, several reports per year)

No. 1 (1968) – No. 44 (1978) +.

(4) Antarctic Geological Map Series (Irregular, 2 or 3 maps per year)

Sheet 1 (1974) – Sheet 7 (1977), 9 (1976), 10 (1977), 11 (1978), 27 Part 1 (1978) +.

(5) **極地研ニュース,** Kyokuchiken Nyūsu (News Bulletin of the National Institute of Polar Research, in Japanese) (Bimonthly)

No. 1 (August, 1974) – No. 25 (June, 1978) +.

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